Q. Code:728200

Reg. No. | | | | | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Second Semester

ME22202 – MANUFACTURING PROCESSES

Mechanical Engineering

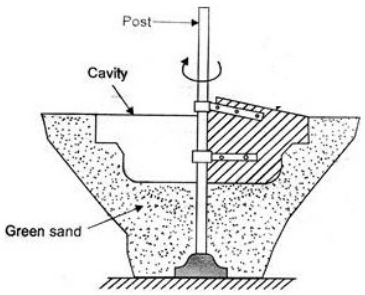
(Regulation 2022)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Select a suitable casting process for a given engineering component.	**3**
CO 2	Given a material, the students will Apply a suitable joining process.	**3**
CO 3	Given a part diagram & its application, students will justify a suitable bulk deformation process.	**3**
CO 4	Students will identify the necessary operations to be performed on a sheet metal and will select a suitable process for a given application.	**3**
CO 5	Students will justify a suitable process for thermoplastics, thermosetting plastics and for cutting tools.	**3**

PART- A (20 x 2 = 40 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Refer the following diagram and brief out why the cracks are occurred in the mould? Also provide a solution so as to make a perfect mould. 	**1**	**3**
2.	Refer the following diagram, identify the type of pattern and list down its suitable applications 	**1**	**3**
3.	How the thickness of the cast product can be controlled in a slush casting process?	**1**	**3**
4.	A cylindrical specimen of dimension Ø30 X 40 mm is to be manufactured using casting process. After manufacturing it was noted that the dimensions of the cast product are Ø28 x 38 mm. Why there is a reduction in the dimension? How to compensate for this reduction.	**1**	**3**

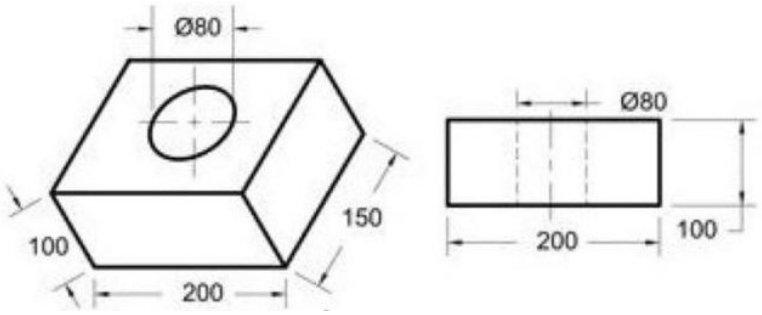
5.	A mild steel plate of 4mm thick has to be welded by gas welding technique. Will you choose rightward or leftward welding technique? Justify your answer with proper statements.	**2**	**3**
6.	When will you select DCSP and DCRP while welding mild steel plates using arc welding process?	**2**	**3**
7.	Why filler metals are required during welding process and mention whether filler material is required for all types of welding? Also state how the welding electrodes are specified.	**2**	**3**
8.	What is the main advantage of using non consumable electrode while welding lengthy joints?	**2**	**2**
9.	When will you choose edging and heading operations in forging? Clarify with a simple diagram.	**3**	**3**
10.	Whether all the metals can be easily extruded by direct or indirect extrusion process? Substantiate with suitable examples.	**3**	**3**
11.	Justify the statement "Cold working produces the components to the closer dimensional tolerances".	**3**	**3**
12.	Differentiate between blooms, billets and slabs.	**3**	**2**
13.	While doing any bending operations, whether the angle of the bend will remain same after bending operation? Justify with a proper explanation.	**4**	**3**
14.	Washers shown in figure 1 has to be manufactured in mass production. List down the equipment and accessories required and also the operations to be performed.	**4**	**3**

figure 1

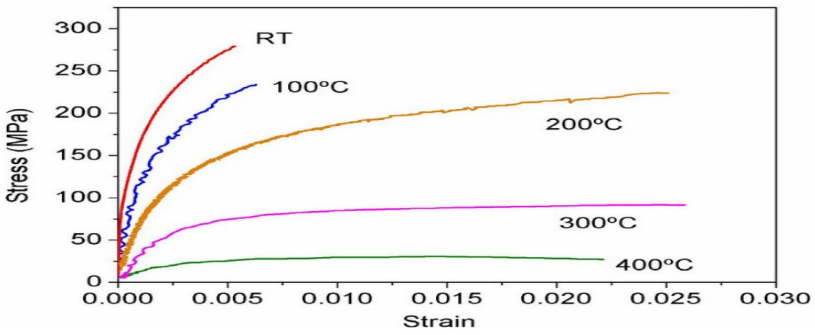
15.	When rubber pad forming and hydroforming process can be selected?	**4**	**3**
16.	What is high energy rate forming (HERF) and how does it differ from conventional forming methods?	**4**	**3**
17.	When compression moulding process can be selected? Give examples.	**5**	**3**
18.	How the overhead tanks from thermoplastics are manufactured? Justify the most economical process for low volume production.	**5**	**3**

19.	How the thermoplastic materials are processed? List them.	**5**	**2**	
20.	How does powder metallurgy contribute to the production of complex shaped components with precise tolerance?	**5**	**3**	

PART- B (5 x 10 = 50 Marks)

		Marks	CO	RBT LEVEL
21. (a)	The casting shown in the figure is to be made from a plain carbon steel using a wooden pattern. Assuming the shrinkage and machining allowance, calculate the dimensions of the pattern. Consider Shrinkage allowance of 20mm/m and Machining allowance of 2 mm / side. Sketch the pattern with the dimensions 	**(10)**	**1**	**3**
	(OR)			
(b)	Sewage pipes from cast iron are to be manufactured. Suggest and explain the suitable manufacturing process for 1. When the production volume is less 2. When the production volume is more.	**(10)**	**1**	**3**
22. (a)	**(i)** Name and explain the welding process with a simple diagram, which uses the consumable electrode and in which the electric arc is beneath the granular flux materials. Also explain for what positions this welding process can be applied.	**(8)**	**2**	**3**
	(ii) If a welder takes 3 minutes to complete an 18 cm long weld. He keeps the voltage at 20 volts and the current 120 amps. What is the total heat input?	**(2)**	**2**	**3**
	(OR)			
(b)	**(i)** A drill tool made from high-speed steel tool has to be welded to a shank made from High carbon steel. What method can be selected? Justify your selection.	**(8)**	**2**	**3**
	(ii) The resistance spot welding of two 1.55 mm thick metal sheets is performed using a welding current of 10000A for 0.25 s. The contact resistance at the interface of the metal sheet is 0.0001Ω. Calculate the heat input in joules.	**(2)**	**2**	**3**

23. (a)	**(i)**	Refer the following graph and provide your analysis regarding the yield strength, tensile strength and percentage elongation.	**(5)**	**3**	**3**



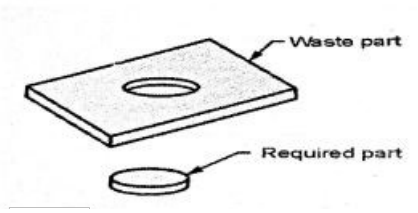
Additionally, explain how these insights can be applied in bulk deformation processes.

	(ii)	Differentiate between hot working and cold working process in terms of working temperature, total energy consumption, dimensional tolerance of the product and the strength of the deformed product.	**(5)**	**3**	**3**

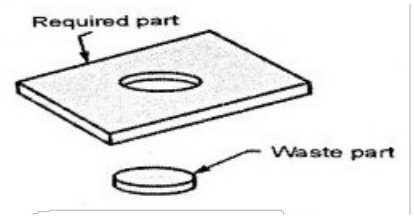
(OR)

(b)	**(i)**	Analyze the concept of grain flow in forged components and its significance in determining mechanical properties.	**(5)**	**3**	**3**
	(ii)	How the hollow tubes are manufactured in direct and indirect extrusion? Sketch the processes.	**(5)**	**3**	**3**

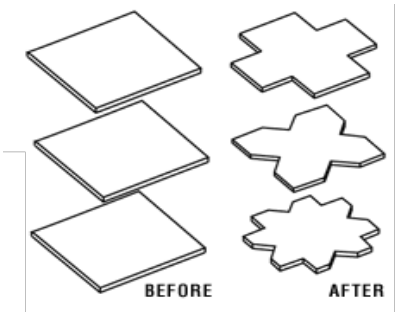
24. (a)		Refer the figures (a-d), and explain what operation is being carried out on the sheet metal. What equipment's have to be used and how that equipment's are specified?	**(10)**	**4**	**3**



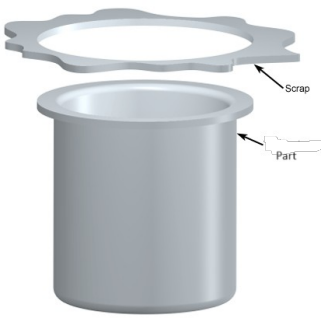
(a)



(b)



(c)



(d)

(OR)

(b)	**(i)**	What forming process is best suited for forming the axis symmetrical components without using the press tools? State its advantages. Explain the process with a neat diagram.	**(8)**	**4**	**3**

(ii)	A circular washer has to be manufactured on a mild steel sheet of 1 mm thick plate whose shear strength is 240 N/mm^2. The outside and inside diameter is 30 mm and 15 mm respectively. Calculate the press tonnage capacity required to perform the above operations.	**(2)**	**4**	**3**
25. (a)	Electrical plugs and switches have to be manufactured in mass production. Select a suitable material and the process with a neat diagram.	**(10)**	**5**	**3**
	(OR)			
(b)	Ceramic / Cubic boron Nitride cutting tool inserts has to be manufactured in mass production. Identify a most economical manufacturing process and explain the process in detail listing their advantages and limitations.	**(10)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
26.	A 100 x 100 mm billet has to converted into 10 mm square bar? Draw the roll pass arrangement for this application.	**(10)**	**3**	**3**